MAP 1. SLOPE OF THE LAND SURFACE

Maryland Geological Survey

Quadrangle Atlas No. 12

HAMPSTEAD QUADRANGLE MARYLAND: HYDROGEOLOGY

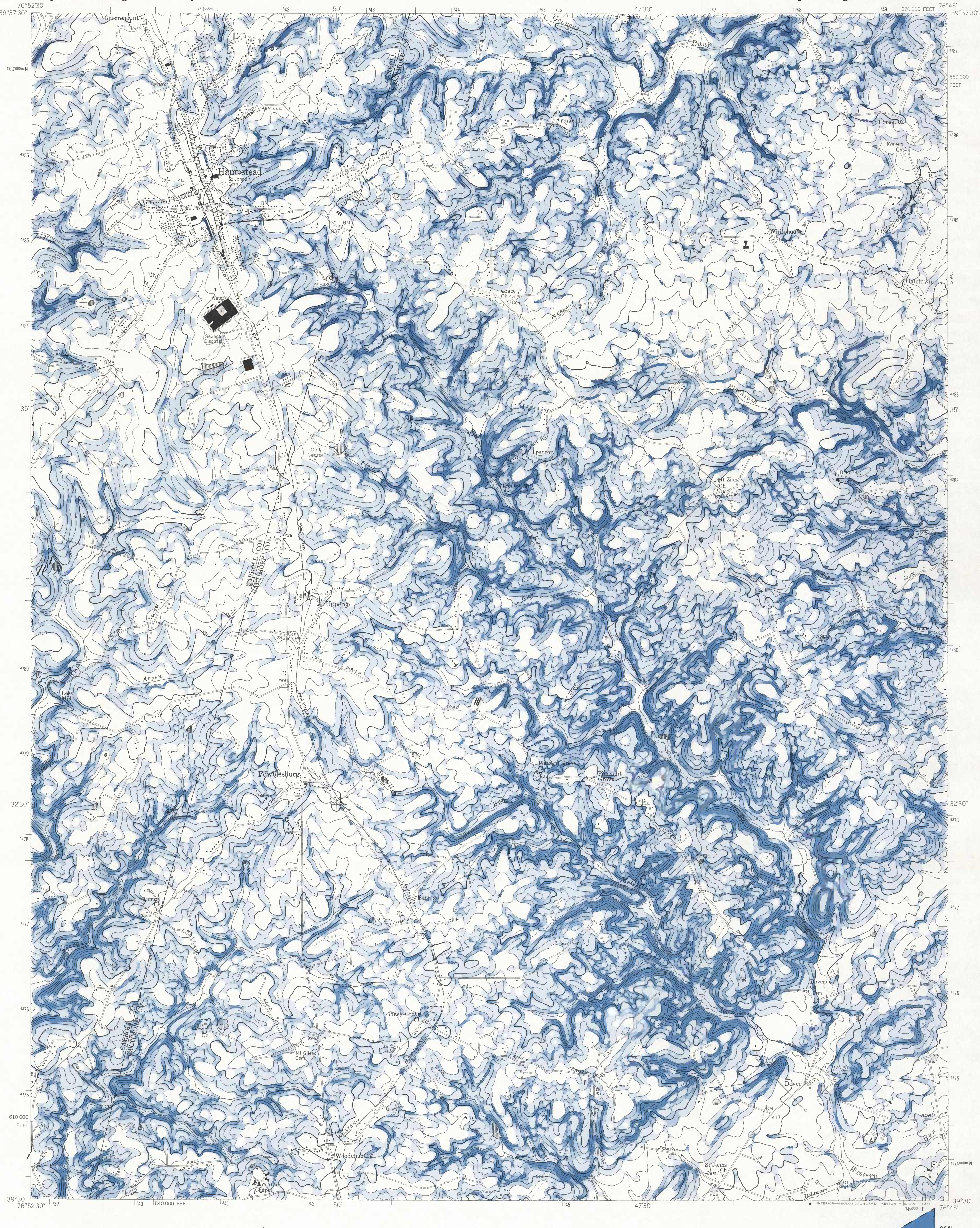
SLOPE OF LAND SURFACE

Prepared by

Photo Science, Inc.

EXPLANATION

This map shows the slope of the land surface in the Hampstead quadrangle, with the slope values grouped into categories. The map was prepared from a 1:24,000-scale topographic contour plate using a semi-automatic photo-mechanical process. In this process, a device measures the distance between adjacent lines and, for the contour interval provided, calculates the slope between the lines. Narrow summits or depressions and similar features may be falsely mapped due to the bending of a line upon itself. Likewise, equal but adjacent contours produce overestimated slopes. Widely separated contour lines may result in an averaging of the intervening slopes. These limitations are only of small extent. The slope categories, which relate to those in the Baltimore County Soil Survey, were selected for their relevance to current and contemplated Baltimore County planning regulations.



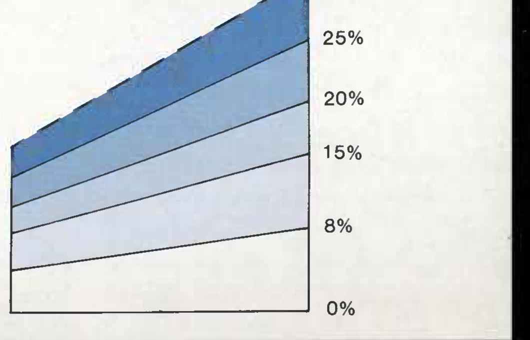
UTM GRID AND 1974 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

1981

MARYLAND
QUADRANGLE LOCATION



HAMPSTEAD QUADRANGLE MARYLAND: HYDROGEOLOGY
LOCATION OF WELLS, SPRINGS, AND TEST HOLES

By

Mark T. Duigon and John T. Hilleary

EXPLANATION

Information for most of the wells was obtained from the records of well drillers. Supplementary wells in Baltimore County not tabulated in the Maryland Geological Survey Basic Data Report No. 1 (Laughlin, 1966) are tabulated in this atlas, and the information has been entered in the National Water Data Storage and Retrieval System (WATSTORE) of the U.S. Geological Survey. Descriptions of Carroll County wells may be found in Maryland Department of Geology, Mines and Water Resources Bulletin 22. Additional records of wells, test holes, and borings are on file with the USGS, Towson, Md.

Since 1945, a permit from the State of Maryland has been required to drill a water well. The numbers corresponding to the permits are included in the well-data tabulations. Since 1973, these numbers have appeared on a tag affixed to the well casing. The well driller must provide certain information when applying for this permit, and additional information upon completion of the well. Well drillers obtain discharge data by various methods, such as using a totaling meter, filling a bucket, or by estimation.

Wells are identified in accordance with a State-wide numbering system. Each county is set up with a grid system based on every fifth minute of latitude and longitude. Each square of the grid is lettered by row and column. Thus, quadrangle CB is the third row from the north and second column from the west. Wells and springs are given alpha-numeric designations, which identify the county, the 5-minute quadrangle, and the well. For example, well BA-CB 129 is in Baltimore County, in the 5-minute quadrangle CB and is the 129th well inventoried in that quadrangle. A "T" is suffixed to the number to denote a test hole.

9 WATER WELL AND NUMBER

164 SPRING AND NUMBER

3T TEST HOLE OR BORE HOLE AND NUMBER

REFERENCES

Dingman, R. J., Ferguson, H. F., and Martin, R. O. R., 1956, The water resources of Baltimore and Harford Counties: Maryland Department of Geology, Mines and Water Resources [1] Bulletin 17, 233 p.

Laughlin, C. P., 1966, Records of wells and springs in Baltimore County, Maryland: Maryland Geological Survey Water Resources Basic Data Report No. 1, 406 p.

Meyer, Gerald, and Beall, R. M., 1958, The water resources of Carroll and Frederick Counties: Maryland Department of Geology, Mines and Water Resources [1] Bulletin 22, 355 p.

[1] The name of this agency was changed to Maryland Geological Survey in June 1964.

SUPPLEMENTAL RECORD OF WELLS IN THE HAMPSTEAD QUADRANGLE

LOCAL NUMBER	STATE PERMIT NUMBER	OWNER	CONTRACTOR	DATE COMPLETED	ALTITUDE OF LAND SURFACE (FEET)	DEPTH OF WELL (FEET)	FINISH	DEPTH CASED (FEET)	CASING DIAMETER (INCHES)	PRINCIPAL AQUIFER	WATER LEVEL (FEET)	DRAW-DOWN (FEET)	DISCHARGE (GALLONS PER MINUTE)	DATE DISCHARGE MEASURED	PUMPING PERIOD (HOURS)	SPECIFIC CAPACITY (GPM/FT)	USE OF WATER	USE OF SITE	TYPE OF LIFT
BA BB 80	BA-73-3714	A T HOMES CORP	EARL JONES	12/27/1976	690	175.00	X	53	6	300PRTB	40.00	58	15	12/27/1976	6.0	0.3	H	W	S
BA BB 91	BA-73-3835	EGE, JOHN	A C REIDER	03/14/1977	720	130.00	X	68	6	300PRTB	30.00	7	2	03/14/1977	6.0	0.3	H	W	S
BA BB 92	BA-73-4427	JO AND J PARTNERS	L EASTERDAY	06/02/1977	720	140.00	X	30	6	300PRTB	37.00	40	12	06/02/1977	6.0	0.3	H	W	S
BA BB 93	BA-73-3305	GLEN FALLS REALEST	A C REIDER	08/07/1976	730	125.00	X	45	6	300PRTB	30.00	10	2	08/07/1976	6.0	0.2	H	W	S
BA BB 94	BA-73-3185	COLE, EDNA	A C REIDER	07/13/1976	760	200.00	X	45	6	300PRTB	40.00	115	2	07/13/1976	6.0	0.0	H	W	S
BA BB 95	BA-73-3031	CABIRAC, RENE E	G EDGAR HARR	06/03/1976	710	225.00	X	79	6	300PRTB	30.00	10	13	06/03/1976	6.0	1.3	H	W	S
BA BB 96	BA-73-2058	UPLAND CONSTRUC	G EDGAR HARR	04/17/1975	680	150.00	X	22	6	300PRTB	36.00	--	50	04/17/1975	6.0	--	H	W	S
BA BB 97	BA-73-0458	PRICE, JOHN	EARL JONES	04/02/1973	690	120.00	X	37	6	300PRTB	30.00	61	10	04/02/1973	6.0	0.2	H	W	S
BA BB 98	BA-73-1989	BAUER, JOHN	A C REIDER	04/03/1975	670	110.00	X	45	6	300PRTB	16.00	--	2	04/03/1975	6.0	--	H	W	S
BA BB 99	BA-73-1761	ESTEP, ALLEN	WM C JAMES	11/08/1974	680	125.00	X	19	6	300PRTB	40.00	--	--	--	--	--	H	W	S
BA BB 100	BA-73-1988	ALDEN, MYLES	A C REIDER	04/02/1975	710	200.00	X	42	6	300PRTB	45.00	85	2	04/02/1975	6.0	0.0	H	W	S
BA BB 101	BA-73-4256	TILLERY, JOE	G EDGAR HARR	06/21/1977	700	350.00	X	42	6	300PRTB	31.00	69	2	06/21/1977	6.0	0.0	H	W	S
BA BB 102	BA-73-2967	DEWCOHOMES INC	A C REIDER	05/26/1976	700	155.00	X	28	6	300PRTB	42.00	61	2	05/26/1976	6.0	0.0	H	W	S
BA BB 103	BA-73-2850	KEMP, WILLIAM L	WM C JAMES	03/15/1976	740	150.00	X	40	6	300PRTB	40.00	--	6	03/15/1976	6.0	--	H	W	S
BA BB 104	BA-73-3473	OSHEA CONST CO	EARL JONES	12/29/1976	670	125.00	X	30	6	300PRTB	25.00	42	15	12/29/1976	6.0	0.4	H	W	S
BA BB 105	BA-73-4086	CLUM, ROBERT	G EDGAR HARR	03/26/1977	665	200.00	X	43	6	300PRTB	26.00	64	3	03/26/1977	6.0	0.0	H	W	S
BA BB 106	BA-73-3769	ARMACOST, DONALD JR	A C REIDER	12/27/1976	718	200.00	X	18	6	300PRTB	30.00	55	2	12/27/1976	6.0	0.0	H	W	S
BA BB 107	BA-73-3426	BLUCHER, JOHN	LEONARD DRLG	09/18/1976	610	140.00	X	82	6	300PRTB	70.00	20	6	09/18/1976	6.0	0.3	H	W	S
BA BB 110	BA-73-3984	KIENLE, EUGENE	C E CAMPBELL	02/05/1977	710	242.00	X	69	6	300PRTB	35.00	15	2	02/05/1977	6.0	0.1	H	W	S
BA BB 115	BA-73-3910	HARDEN, RAYMOND	WM C JAMES	02/19/1977	710	145.00	X	102	6	300PRTB	55.00	30	4	02/19/1977	6.0	0.1	H	W	S
BA BB 116	BA-73-4346	GIVEN DISTEFAND	L EASTERDAY	06/02/1977	725	160.00	X	40	6	300PRTB	21.00	45	10	06/02/1977	6.0	0.2	H	W	S
BA BB 118	BA-73-2119	SCHMIDT, RONALD	G EDGAR HARR	05/23/1975	660	200.00	X	79	6	300PRTB	40.00	3	12	05/23/1975	6.0	4.0	H	W	S
BA BB 119	BA-73-2221	SPARKS, LORRING	G EDGAR HARR	07/16/1975	725	100.00	X	30	6	300PRTB	25.00	25	8	07/16/1975	6.0	0.3	I,H	W	S
BA BB 120	BA-73-0205	ELSEROAD, JOHN	DANA KYKER	10/09/1972	760	173.00	X	83	6	300PRTB	80.00	90	6	10/09/1972	10.0	0.1	H	W	S
BA BB 126	BA-73-2089	HENCK, CHARLES	D NELSON	06/07/1975	690	150.00	X	60	6	300PRTB	23.00	92	22	06/07/1975	6.0	0.2	H	W	S
BA BB 129	BA-73-3410	MAINSTER, J W	DANA KYKER	08/23/1976	730	220.00	X	90	6	300PRTB	41.00	156	5	08/23/1976	6.0	0.0	H	W	S
BA BB 130	BA-73-3183	REEDER, CARL	EARL JONES	07/16/1976	705	175.00	X	20	6	300PRTB	41.00	84	5	07/16/1976	6.0	0.1	H	W	S
BA BB 132	BA-73-4939	HOOVER, STANLEY	A C REIDER	09/30/1977	740	100.00	X	44	6	300PRTB	42.00	--	2	09/30/1977	6.0	2.0	H	W	S
BA BB 133	BA-73-4969	NULL, RUSSEL JR	DANA KYKER	12/01/1977	690	227.00	X	83	6	300PRTB	90.00	92	6	12/01/1977	6.0	0.1	H	W	S
BA BB 134	BA-73-4086	CLUM, ROBERT	G EDGAR HARR	03/26/1977	665	200.00	X	--	--	300PRTB		--	0.00	03/26/1977	--	0.0	--	Z	--
BA CA 60	BA-73-3109	LANKFORD, JAMES	A C REIDER	06/16/1976	730	125.00	X	58	6	300PLGV	33.00	30	2	06/16/1976	6.0	0.1	H	W	S
BA CA 61	BA-73-3998	BARRICK, LEE	WATER INC	03/29/1977	670	142.00	X	76	6	300PNRN	20.00	5	7	03/29/1977	6.0	1.4	H	W	S
BA CA 62	BA-73-4437	HEAGERTY, JOSEPH F	W W REICHART	06/11/1977	690	125.00	X	21	6	300PLGV	50.00	10	8	06/11/1977	6.0	0.8	H	W	S
BA CA 63	BA-73-4132	TOLSON CONST CO	C C CAMPBELL	04/08/1977	722	145.00	X	85	6	300PLGV	40.00	25	5	04/08/1977	6.0	0.2	H	W	S
BA CA 64	BA-73-3975	LOCKHARD, FRANCIS	G EDGAR HARR	02/25/1977	645	100.00	X	20	6	300PNRN	33.00	2	9	02/25/1977	6.0	4.5	H	W	S
BA CA 65	BA-73-5318	WELSH, CHARLES	A C REIDER	02/01/1978	770	125.00	X	82	6	300PRTB	38.00	5	2	02/01/1978	6.0	0.4	H	W	S
BA CA 66	BA-73-5581	ARMACOST, JEFFREY	MARYLAND DLG	04/18/1978	790	210.00	X	94	6	300PRTB	38.00	47	3	04/18/1978	6.0	0.1	H	W	--
BA CB 97	BA-73-3119	PLEAS GR U M CHURCH	WATER INC	06/17/1976	590	142.00	X	50	6	300PLGV	30.00	5	8	06/17/1976	6.0	1.6	T	W	S
BA CB 98	BA-73-3316	LINDENMUTH, PAUL	A C REIDER	12/02/1976	550	125.00	X	48	6	300PNRN	46.00	14	8	12/02/1976	6.0	0.6	H	W	S
BA CB 99	BA-73-1835	PELTZER, JAMES H	G EDGAR HARR	12/04/1975	670	175.00	X	68	6	300PLGV	28.00	--	10	12/04/1975	6.0	--	H	W	S
BA CB 100	BA-73-2634	HACKETT, JAMES	D NELSON	01/16/1976	570	250.00	X	20	6	300LCRV	30.00	150	2	01/16/1976	6.0	0.0	H	W	S
BA CB 101	BA-73-1099	PIPER AND CO	A C REIDER	02/28/1974	520	143.00	X	57	6	300LCRV	16.00	114	2	02/28/1974	6.0	0.0	H	W	S
BA CB 102	BA-73-2676	BOSLEY, GARY	G EDGAR HARR	02/05/1976	705	150.00	X	40	6	300PLGV	26.00	--	10	02/05/1976	6.0	--	H	W	S
BA CB 103	BA-73-1922	TRACEY, BRUCE A	WATER INC	03/03/1975	690	187.00	X	30	6	300PRTB	75.00	65	2	03/03/1975	6.0	0.0	H	W	S
BA CB 104	BA-73-1721	WALTER, RICHARD	DANA KYKER	09/24/1974	670	280.00	X	75	6	300PRTB	80.00	164	4	09/24/1974	7.0	0.0	H	W	S
BA CB 105	BA-73-2822	KENNY, JOHN	G EDGAR HARR	03/12/1976	620	125.00	X	60	6	300PLGV	50.00	--	5	03/12/1976	6.0	--	H	W	S
BA CB 106	BA-73-3041	POSKA, MARTIN	DANA KYKER	07/07/1976	630	173.00	X	91	6	300PLGV	95.00	23	7	07/07/1976	6.0	0.3	H	W	S
BA CB 107	BA-73-2453	PALERMO, WILLIAM	G EDGAR HARR	10/15/1975	630	175.00	X	20	6	300PLGV	50.00	--	12	10/15/1975	6.0	--	H	W	S
BA CB 108	BA-73-0545	TRACEY, JOHN C	JOHN D WELLS	04/16/1973	750	112.00	X	21	6	300PRTB	30.00	20	9	04/16/1973	6.0	0.5	H	W	S
BA CB 109	BA-73-3016	HAMPT, LESTER	WATER INC	06/08/1976	690	112.00	X	38	6	300PRTB	40.00	--	6	06/08/1976	6.0	--	H	W	S
BA CB 110	BA-73-4332	KLEINFIELD, TERRY	G EDGAR HARR	05/16/1977	710	300.00	X	84	6	300PLGV	60.00	28	4	05/16/1977	6.0	0.1	H	W	S
BA CB 111	BA-73-3529	WILKINS, THOMAS J	A C REIDER	10/18/1976	650	100.00	X	37	6	300PNRN	35.00	7	2	10/18/1976	6.0	0.3	H	W	S
BA CB 112	BA-73-3346	ZIMMERMAN, CHARLES	L EASTERDAY	09/29/1976	630	200.00	X	19	6	300PNRN	40.00	100	8	09/29/1976	6.0	0.1	H	W	S
BA CB 113	BA-73-4087	COWMAN, ED	G EDGAR HARR	03/17/1977	690	175.00	X	28	6	300PNRN	44.00	--	4	03/17/1977	6.0	--	H	W	S
BA CB 114	BA-73-3900	KIRSCH HOMES	WATER INC	03/23/1977	625	202.00	X	80	6	300PLGV	55.00	55	2	03/23/1977	6.0	0.0	H	W	S
BA CB 115	BA-73-4095	POWELL, FRANK	C C CAMPBELL	03/21/1977	680	145.00	X	51	6	300PLGV	30.00	20	6	03/21/1977	6.0	0.3	H	W	S
BA CB 116	BA-73-1332	WALKER, RICHARD	WATER INC	04/15/1974	645	157.00	X	47	6	300PLGV	55.00	29	3	04/15/1974	0.6	0.1	H	W	S
BA CB 117	BA-73-0974	CAMPBELL, CHARLES C	JOHN GREENE	02/24/1974	625	305.00	X	40	6	300PLGV	25.00	40	6	02/24/1977	6.0	0.2	H	W	S
BA CB 118	BA-73-5009	WALTER, RALPH	G EDGAR HARR	10/16/1977	575	300.00	X	42	6	300PNRN	28.00	222	3	10/16/1977	6.0	0.0	S	W	S
BA CB 119	BA-73-4727	TWAROWSKI, MARK	WATER INC	08/18/1977	490	127.00	X	24	6	300PLGV	21.00	79	6	08/18/1977	3.0	0.1	H	W	S
BA CB 120	BA-73-2835	SIEBERT, PAUL	A C REIDER	03/16/1976	690	110.00	X	58	6	300PLGV	35.00	65	2	03/16/1976	6.0	0.0	H	W	S
BA CB 121	BA-73-1264	MORFOOT, LARRY	WM C JAMES	04/18/1974	740	125.00	X	22	6	300PRTB	40.00	--	8	04/18/1977	6.0	--	H	W	S
BA CB 122	BA-73-4531	ZOUCK, JOHN	G EDGAR HARR	06/27/1977	370	100.00	X	36	6	300CCKV	28.00	1	5	06/27/1977	6.0	5.0	H	W	S
BA CB 123	BA-73-4933	CAPLES AND PHEL	WM C JAMES	09/24/1977	420	100.00	X	19	6	300CCKV	30.00	70	9	09/24/1977	1.0	0.1	H	W	S
BA CB 124	BA-73-5117	MARKLAND, WIONA	C C CAMPBELL	10/31/1977	690	405.00	X	103	6	300PNRN	40.00	120	2	10/31/1977	6.0	0.0	H	W	S
BA CB 125	BA-73-2451	ZOUCK, JOHN H	G EDGAR HARR	10/09/1975	395	100.00	X	70	5.63	300CCKV	24.00	--	6	10/09/1975	6.0	--	H	W	S
BA CB 126	BA-73-5061	WASHER, DAVID	G EDGAR HARR	12/08/1977	580	175.00	X	28	6	300PLGV	32.00	118	6	12/08/1977	4.0	0.1	H	W	S
BA CB 127	BA-73-5134	BUELL, HARRY	G EDGAR HARR	03/11/1978	750	200.00	X	64	6	300PRTB	70.00	2	2	03/11/1978	6.0	1.0	H	W	S
BA CB 128	BA-73-3816	WARNER, WM JR	W W REICHART	12/23/1976	730	125.00	X	43	6	300PRTB	--	--	8	12/23/1976	1.0	--	H	W	S
BA CB 129	BA-73-4332	KLEINFIELD, TERRY	G EDGAR HARR	05/16/1977	710	250.00	X	--	--	300PLGV		--	0.00	05/16/1977	--	--	--	Z	--
BA CB 131	BA-73-5509	REED, STERLING W	C C CAMPBELL	04/03/1978	770	245.00	X	59	6	300PRTB	35.00	45	4	04/03/1978	6.0	0.1	H	W	S

FINISH CODES

X OPEN HOLE

PRINCIPAL AQUIFER CODES

300PRTB PRETTYBOY SCHIST
300PLGV PLEASANT GROVE SCHIST
300PNRN PINEY RUN FORMATION
300LCRV LOCK RAVEN SCHIST
300CCKV COCKEYSVILLE MARBLE

WATER USE CODES

H DOMESTIC
I IRRIGATION
T INSTITUTION
S STOCK

SITE USE CODES

W WITHDRAWAL
Z DESTROYED

LIFT TYPE CODES

S SUBMERSIBLE

SUPPLEMENTAL RECORD OF SPRINGS IN THE HAMPSTEAD QUADRANGLE

Number	Owner	Altitude (Feet)	Topographic Setting	Aquifer	Use	Yield (Gallons Per Minute)	Remarks
BA-BB 135	Armacost, Raymond	720	W	300PRTB	U	--	Discharge piped to Blackrock Run.
BA-CB 130	Washer, David	580	S	300PRTB	U	--	Formerly supplied house, but contaminated with bacteria and replaced by well BA-CB 126.

TOPOGRAPHIC SETTING CODES

W UPLAND DRAW
S HILLSIDE

AQUIFER CODES

300PRTB PRETTYBOY SCHIST

USE CODES

U UNUSED

MAP 2. LOCATION OF WELLS, SPRINGS, AND TEST HOLES

Maryland Geological Survey Quadrangle Atlas No. 12

Topography from aerial photographs by stereophotogrammetric methods. Aerial photographs taken 1943. Field check 1944. Culture revised by the Geological Survey 1953 from aerial photographs taken 1952

PHOTOREVISED 1974

UTM GRID AND 1974 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

QUADRANGLE LOCATION

1981

Prepared in cooperation with the United States Geological Survey, the Baltimore County Office of Planning and Zoning and the Commissioners of Carroll County.

MAP 3. DEPTH TO THE WATER TABLE

Maryland Geological Survey

Quadrangle Atlas No. 12

HAMPSTEAD QUADRANGLE MARYLAND: HYDROGEOLOGY DEPTH TO THE WATER TABLE

By

Mark T. Duigon

EXPLANATION

This map shows the distance from the land surface to the water table (top of the zone of saturation), based primarily on records kept by water well drillers. The drillers note the static level (depth to water when not pumping) in the wells they drill. These data were supplemented by soils maps and field observations of springs, swamps, and other natural features. The map shows that the water table is generally shallowest adjacent to streams and deepest under summits of hills and ridges.

The water table is part of a dynamic system and responds to various stresses (for example, precipitation and evapotranspiration), usually being highest in the spring (in response to greater amounts of rain) and lowest in late summer (after dry periods, plant transpiration, and evaporation). Springs can, in places, indicate fluctuations in the water-table. A flowing spring indicates that the water table is at the land surface. If the spring ceases to flow, it indicates that the water table has receded to some distance below the land surface.

Figure 1 shows a 19 1/2-year continuous record of water levels in well CL-BF 1, in the town of Hampstead. Seasonal variations are readily apparent; the long record shows that there are also differences in annual means.

Pumping of wells produces a temporary lowering of the water table (drawdown), but, in this region, the effect is generally restricted to the immediate vicinity of the well. The amount of drawdown varies considerably, depending on the hydrologic properties of the aquifer, pumping rate, and length of pumping period. The amount of drawdown expected is an important factor in planning well depth and location of the pump intake in the well.

In some areas, rainwater that is seeping into the ground encounters an impermeable barrier and puddles on top of it; the material below the barrier remains unsaturated. The surface of the saturated zone above the impermeable barrier is known as a perched water table. Such perched zones of saturation in this area are usually temporary and of small extent. They are not shown on this map.

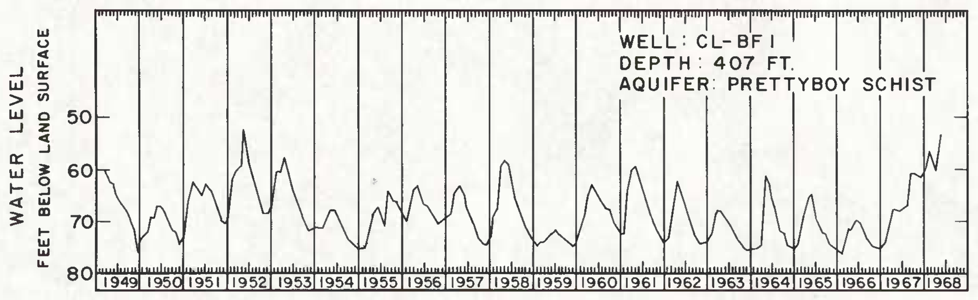
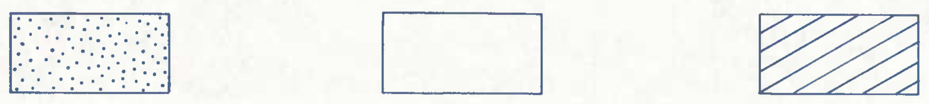


Figure 1. Continuous record of water levels in well CL-BF 1, Hampstead (from Nutter and Otton, 1969)

APPROXIMATE DEPTH TO WATER TABLE BELOW LAND SURFACE



Less than 10 feet

10 - 35 feet

Greater than 35 feet

REFERENCE

Nutter, L. J., and Otton, E. G., 1969, Ground-water occurrence in the Maryland Piedmont. Maryland Geological Survey, Report of Investigations No. 10, 56 p.

Topography from aerial photographs by stereophotogrammetric methods. Aerial photographs taken 1943. Field check 1944 Culture revised by the Geological Survey 1953 from aerial photographs taken 1952

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MARYLAND

QUADRANGLE LOCATION

Prepared in cooperation with the United States Geological Survey, the Baltimore County Office of Planning and Zoning and the Commissioners of Carroll County.

HAMPSTEAD QUADRANGLE MARYLAND: HYDROGEOLOGY AVAILABILITY OF GROUND WATER

By

Mark T. Duigon

EXPLANATION

The ground-water availability units presented on this map are based on statistical evaluation of reported specific capacities (discharge, in gal/min, divided by drawdown, in ft) of wells drilled in Baltimore and Carroll Counties, and grouped by geologic unit. The geologic units correspond to the mapping units of Crowley (1976a, 1976b). Because specific capacity changes with time as a well is pumped, only wells that have been tested by pumping for a 3-hour-minimum duration were included in the analyses. The groups were tested for significant (95-percent confidence level) differences by the Kruskal-Wallis and Wilcoxon nonparametric tests (Sokol and Rohlf, 1969; Rohlf and Sokol, 1969). The results suggest the presence of three populations or units in the Hampstead quadrangle. These units are described below.

○ Well with reported yield less than 2 gal/min.

● Well with reported yield greater than 15 gal/min.

GEOHYDROLOGIC UNIT 1, not present in this quadrangle, is underlain by Coastal Plain sediments and is located elsewhere in Baltimore County.

2

GEOHYDROLOGIC UNIT 2: This unit is underlain by carbonate rocks. It is underlain by a calcareous schist zone of the Prettyboy Schist in the northwest corner of the quadrangle, and in the southeast corner it is underlain by a strip of the massive metadolostone member of the Cockeysville Marble. Both parts of this unit occupy topographically low areas because of the solubility of the rock.

Reliable well-yield data for Unit 2 were unavailable in the Hampstead quadrangle; data from geologically similar areas elsewhere in Baltimore and Carroll Counties were analyzed to predict potential yields in Unit 2 in the Hampstead quadrangle. The yields of nine such wells range from 7 to 60 gal/min; the median is 10 gal/min. Specific capacities range from 0.11 (gal/min)/ft to 1.7 (gal/min)/ft; the median is 0.80 (gal/min)/ft. Well depths range from 50 to 185 ft; median depth is 80 ft below land surface.

Wells drilled in Unit 2 will generally be adequate for domestic use, and, with proper construction and design, may serve for municipal and some commercial or industrial supply. Flooding is a possible hazard because this unit occupies valleys. Flood waters can damage equipment if suitable precautions are not taken, and contamination by surface waters can occur if the well casing is not properly driven into unweathered rock and grouted.

3

GEOHYDROLOGIC UNIT 3: This is the most widespread unit in the Hampstead quadrangle and is highly variable. The area is underlain by several geologic formations, mostly schist, with smaller areas of marble and gneiss. The topography is generally rolling, but, where underlain by marble, less relief prevails. Noncarbonate rocks adjacent to the marble form ridges.

Yields of 562 wells in the Hampstead and surrounding quadrangles range from 0.0 gal/min to 117 gal/min and have a median of 6.0 gal/min. Figure 1 shows distribution of well yields calculated from specific capacities.

The range of specific capacities is from 0.00 (gal/min)/ft to 7.0 (gal/min)/ft. The median is 0.15 (gal/min)/ft. The distribution of well yields and specific capacities is dominated by low values, but a few wells are rather productive. As most of the wells analyzed are domestic wells, they may not be indicative of the potential of the aquifer. Improved techniques of well location, construction, and stimulation can result in greater production, but these methods are usually uneconomical for domestic wells. Well depths range from 36 ft to 505 ft below land surface; median depth is 150 ft.

Water quality is variable in this unit, being harder where the unit is underlain by marble and softer and more acidic where the unit is underlain by schist.

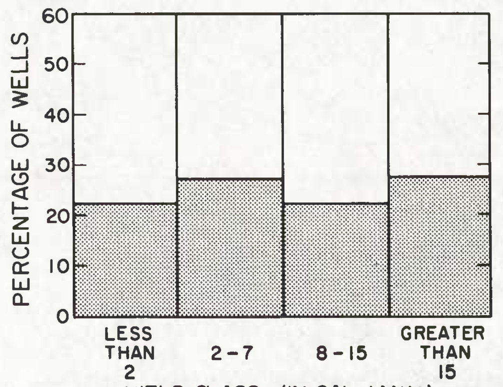

Figure 1. Well-yield distribution for Geohydrologic Unit 3 (562 wells).

4

GEOHYDROLOGIC UNIT 4: This unit occurs in a northeast-southwest trending band in the southeastern part of the quadrangle. The smaller area to the southeast is underlain by the garnet-staurolite and the garnet-kyanite facies of the Loch Raven Schist, which is characterized here by the presence of these minerals. Unit 4 is the least productive unit in the Hampstead quadrangle. The yields of 57 wells range from 0.0 gal/min to 60 gal/min; the median is 3.0 gal/min. Figure 2 shows distribution of well yields calculated from specific capacities. Specific capacities range from 0.00 (gal/min) ft to 6.0 (gal/min)/ft; the median is 0.04 (gal/min)/ft, which means that a drawdown of 50 ft is required to produce 2 gal/min. Depths range from 62 ft below the land surface to 600 ft; the median is 175. ft.

The risk of being unable to obtain a well adequate for domestic use is rather high (23 percent of the wells reportedly yield less than the 2 gal/min considered adequate for domestic use). Wells in this unit are most frequently deeper and, therefore, more expensive. Homes on this unit may require specially designed water-supply systems and conservation methods. (See, for example, Wright, 1977). The likelihood of obtaining a well capable of meeting demands higher than domestic use is low.

GEOHYDROLOGIC UNIT 4 (continued)

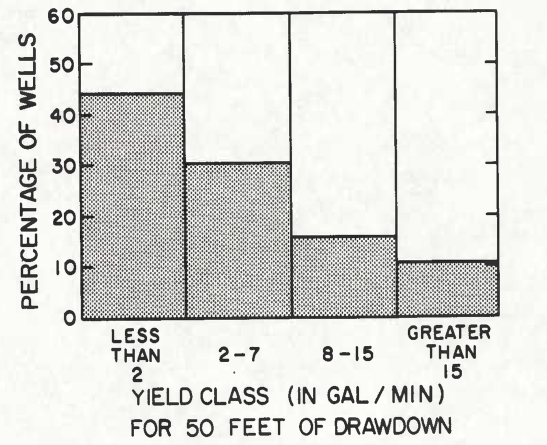

Figure 2. Well-yield distribution for Geohydrologic Unit 4 (57 wells).

SUMMARY

A total of 628 wells analyzed for the Hampstead quadrangle and vicinity have yields ranging from 0 to 117 gal/min; the median is 6.0 gal/min. Values for upper and lower quartiles of yield are 10.0 gal/min and 2.5 gal/min, respectively. Of the total number of wells analyzed, 13 percent were reported to yield less than the 2 gal/min minimum considered adequate for domestic use. Specific capacities of these wells range from 0.00 to 7.0 (gal/min)/ft. Median specific capacity is 0.14 (gal/min)/ft. Figure 3 is a specific-capacity frequency graph for each of the three units in the Hampstead quadrangle.

Depths of the wells range from 36 ft below land surface to 600 ft. Median well depth is 150 ft.

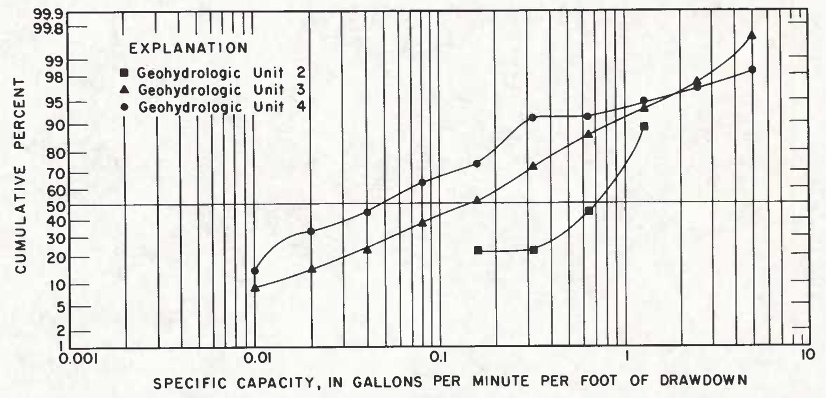

Figure 3. Cumulative frequencies for specific capacities of each geohydrologic unit.

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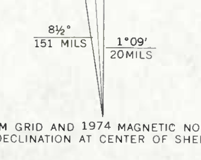
MAP 4. AVAILABILITY OF GROUND WATER

Maryland Geological Survey

Quadrangle Atlas No. 12

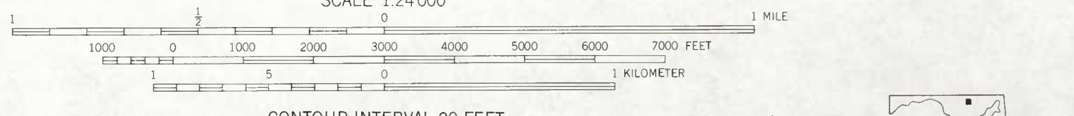
Topography from aerial photographs by stereophotogrammetric methods. Aerial photographs taken 1943. Field check 1944 Culture revised by the Geological Survey 1953 from aerial photographs taken 1952

PHOTOREVISED 1974



UTM GRID AND 1974 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000



CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

1981

QUADRANGLE LOCATION

Prepared in cooperation with the United States Geological Survey, the Baltimore County Office of Planning and Zoning and the Commissioners of Carroll County.

HAMPSTEAD QUADRANGLE MARYLAND: HYDROGEOLOGY
GEOHYDROLOGIC CONSTRAINTS ON SEPTIC SYSTEMS

By
Mark T. Duigon

INTRODUCTION

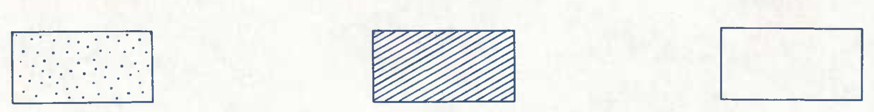
Where centralized sewage systems are not available, wastes from individual homes must be disposed in other ways, generally within the bounds of the homesite. These wastes are composed of many different substances including urine, fecal matter, laundry soaps and cleaning compounds, and food scraps--all transported out of the house as a slurry by mixing with large quantities of water. Some of these are toxic; others support bacteria and viruses. Reduction in quantity or deactivation of these substances is necessary to prevent contamination or pollution of the environment.

The usual method of disposing of such wastes is to feed the slurry into a septic tank (to separate the liquid from solids and greases), which releases a partly decomposed effluent into a seepage pit or tile field for infiltration through soil. It is in the soil (or underlying saprolite, in most places in the Piedmont) where most of the renovation occurs as the effluent percolates toward the saturated zone.

Careful construction and maintenance of disposal systems are essential. Negligent construction of tile fields is as common a cause of failure, as incorrect soil evaluation or system design (Coulter and others, 1961, p. 17). Lack of periodic maintenance is a primary reason for failure of over 15 percent of approximately 30,000 individual disposal systems in Baltimore County (Marvin Cook, oral commun., 1978). Systems that operate according to different principles may be more effective, but, if not maintained, they lose their effectiveness and fail more readily than seepage pits or tile fields combined with a septic tank.

This map indicates the relative degree to which the geohydrologic environment may adversely affect or be affected by the operation of septic-tank systems, based on the constraint factors described below.

The following diagram shows the relative degree of these effects between the three units:



CONSTRAINT FACTORS

1. Flood hazard: Disposal systems do not drain properly when flooded and may be physically damaged. Contamination of surface water is possible when flood waters mix with effluent, and can spread to ground-water supplies.

2. Shallow water table: If effluent enters the ground-water system before it has passed through enough soil for adequate renovation, it will contaminate the system. Several feet separation is required from the base of the seepage system to the water table.

3. Depth to bedrock: Fractures in bedrock act as ground-water conduits, and renovation of effluent is not effective. Therefore, the thickness of unconsolidated material between the base of the seepage system and the bedrock surface needs to be sufficient.

4. Slope: Steep slopes generally have a thin soil cover and are likely to allow effluent to emerge at the surface. Baltimore and Carroll Counties allow a maximum slope of 25 percent. Sternberg (written commun., 1974) concluded that, where the slope exceeds 20 percent, effluent will come to the surface downslope from a drainfield regardless of soil type or depth of trenches. Measured slopes used as a basis for this map were obtained from Map 1.

5. Infiltration rate: This factor affects the design of the disposal system. If infiltration is too slow, effluent will move sluggishly and may back up. If too fast, renovation will be inadequate. In Maryland, the infiltration rate is evaluated at the site by a percolation test 1/.

Most of these factors are individually evaluated on a broad scale by the U.S. Department of Agriculture, Soil Conservation Service (Matthews, 1969, and Reybold and Matthews, 1976) and are presented in tabular form by mapping units. This map presents those evaluations integrated with field observations by the author, water-table and slope data in this atlas, and consideration of percolation tested by county officials. This map cannot substitute for onsite evaluations, as discussed in the section, Limitations of Maps.

1/ The percolation test in Baltimore County consists of digging at least two holes to bedrock or as deep as the backhoe will dig (about 16 ft). This is to determine if the water table or bedrock surface is high. A lateral extension of the first hole is dug to an approximate depth of 5 ft (initially), and, at the bottom, a 1x1x1-ft hole is hand-dug. This small hole is filled with water to a level of 7 in. above the base of the hole. The level is allowed to drop 1 in. and then is timed as it drops a second inch. The test is considered successful if the level takes from 2 to 30 minutes to drop the second inch. If the test fails, it is repeated at a greater depth or at another location. A proposed building lot must have a successful percolation test before a building permit will be issued, if sewage is to be disposed onsite. The testing health official also notes any other factors that may affect operation of the disposal system, such as impermeable layers. The Carroll County percolation test is similar.

MAP UNITS

UNIT I: Disposal facilities constructed in this unit are likely to fail. The unit generally occurs adjacent to streams and lakes. It is characterized by one or more of the following critical factors: Subject to flooding; water table less than 10 ft from land surface; land slopes exceeding 25 percent; the presence of soils having low permeability (less than 0.63 in/hr, equivalent to greater than 95 min/in). Includes soils that have developed on alluvium and are subject to flooding, such as the Melvin silt loam and Baile silt loam, and residual soils, such as the Mt. Airy channery loam, which is characterized by bedrock depths of less than 3 ft, and Manor soils having greater than 25-percent slopes.

UNIT II: Conditions in this unit are not as severe as in Unit I, but several factors may combine to affect disposal systems adversely. Onsite evaluation is of particular importance because of variability and, in places, marginality. Unit II occurs mainly in patches adjacent to Unit I, but farther upslope from stream channels. It generally corresponds with areas mapped as Manor or Glenelg soils having moderate (15 to 25 percent) slopes. It also includes areas mapped as Conestoga soils, which formed in saprolite weathered from calcareous mica schist and associated marble or limestone, areas of scattered outcrops, stony areas, and areas where the land has been modified and is, therefore, variable in several properties. Depths to water table and bedrock vary; for example, depth to bedrock beneath Manor soils is reported as 3 1/2 to 10 ft.

UNIT III: This is the most favorable unit for disposal systems, but inclusion in this unit does not guarantee suitability of a particular site for sewage disposal. Generally found in well-drained interstream areas and dominated by Chester, Glenelg, and Manor soils of gentle (less than 15 percent) slopes developed on material derived from schist and phyllite. Also includes Legore soils of gentle slopes and Baltimore soils having slopes less than 8 percent. Permeability varies (0.63 to 6.3 in/hr or 95 to 9.5 min/in), but is generally adequate. The water table and bedrock are at depths greater than 10 ft.

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MAP 5. GEOHYDROLOGIC CONSTRAINTS ON SEPTIC SYSTEMS

Maryland Geological Survey Quadrangle Atlas No. 12

Topography from aerial photographs by stereophotogrammetric methods. Aerial photographs taken 1943. Field check 1944 Culture revised by the Geological Survey 1953 from aerial photographs taken 1952

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SCALE 1:24 000

1981

MARYLAND
QUADRANGLE LOCATION

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STATE OF MARYLAND
DEPARTMENT OF NATURAL RESOURCES
MARYLAND GEOLOGICAL SURVEY
Kenneth N. Weaver, Director

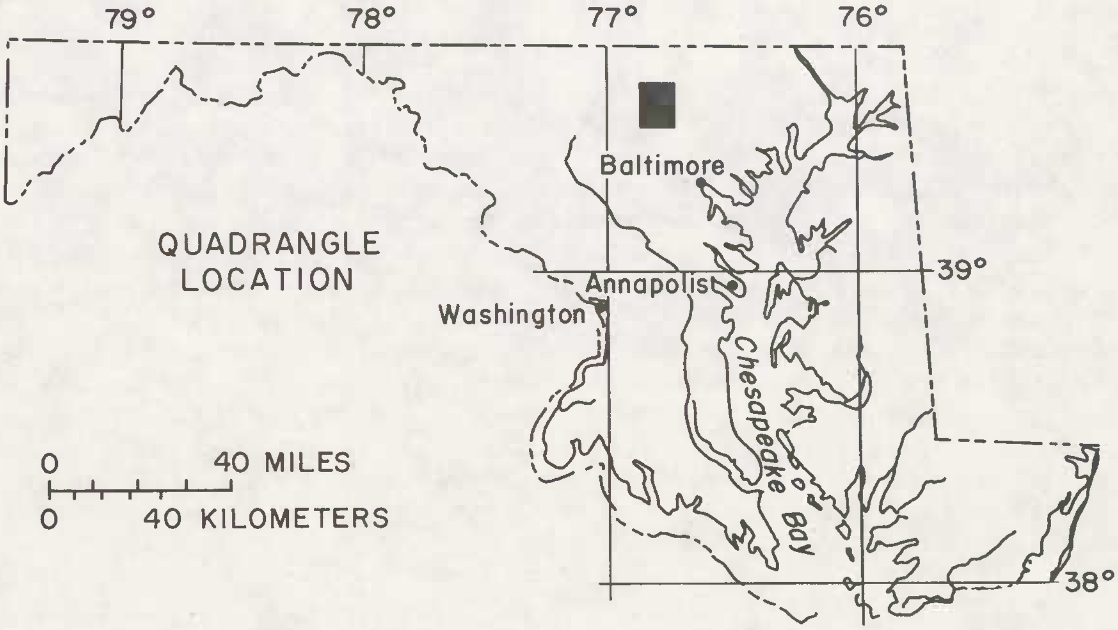
QUADRANGLE ATLAS NO. 12
HAMPSTEAD QUADRANGLE: HYDROGEOLOGY

By
Mark T. Duigon

INTRODUCTION

This atlas describes the hydrogeology of the Hampstead 7 1/2-minute quadrangle in northwestern Baltimore County and northeastern Carroll County, Maryland. The information contained herein is intended for use by planners, health officials, developers, environmental consultants, and the public, who are concerned with how ground water affects land use and how it is, in turn, affected by development.

The climate of this area is humid temperate, with an average annual temperature of 53°F and an average annual precipitation of 44 inches (Vokes and Edwards, 1974, p. 20, 28).



The Hampstead quadrangle lies within the eastern division of the Piedmont physiographic province (Vokes and Edwards, 1974, p. 37). The area exhibits rolling topography typical of that province. In the southeastern part of the quadrangle, some lithologic control of topography can be seen; marble underlies valleys and lowlands, and adjacent resistant gneiss and schist formations stand out as ridges. Along major streams and part way up their tributaries, some valleys are steep-sided, except where they cross marble bedrock. Two-thirds of the area drains into Gunpowder Falls, and one-third drains into the Patapsco River. The Western Maryland Railroad follows the drainage divide.

Magnitudes and frequencies of stream discharges in Maryland are described by the U.S. Geological Survey (Walker, 1971). There are no long-term USGS stream gages in the Hampstead quadrangle; however, Walker (1971) presents a method for estimating streamflow characteristics at ungaged sites by physical characteristics of the drainage basin. On Georges Run, near Armacost, 10 discharge measurements during 1956-66 were used to determine the magnitude and frequency of low flows at that site (Walker, 1971). There are several long-term gaging stations in adjacent quadrangles.

Agriculture is still important in this area, although some farmland has been turned to residential use. Corn and wheat are the chief crops. Dairy products and horse farming are significant parts of the economy. A tool-manufacturing plant is located in Hampstead, which, with a population of about 700, is the largest population center.

The Hampstead quadrangle lies about midway between Prettyboy and Liberty Reservoirs, but is served by neither. Most of the area is supplied by individual wells; the public water system for the town of Hampstead is supplied by water from a series of wells in the town.

GEOLOGY

The Hampstead quadrangle is underlain by crystalline metamorphic rocks, chiefly schist and phyllite, and significant amounts of marble and gneiss. The stratigraphic nomenclature used in this report is that proposed by William Crowley (1976a) and does not necessarily follow the usage of the USGS. The schist and phyllite formations constitute what has been called the "Wissahickon Formation of probable Lower Paleozoic age." However, this unit has been subdivided into several formations and the term "Wissahickon" is elevated to Group status (Crowley, 1976a). Of these formations, those in the Hampstead quadrangle (Crowley, 1976b) are the Prettyboy Schist, Pleasant Grove Schist, Piney Run Formation, Loch Raven Schist, and Sykesville Formation. The older Cockeysville Marble of probable early Paleozoic age is divided into a metalimestone unit and a metadolostone unit. The gneiss in the Hampstead quadrangle is the layered gneiss member of the Baltimore Gneiss of Precambrian age. Other units of small extent are also present.

CAMBRO-ORDOVICIAN(?)	Glenarm Supergroup	Wissahickon Group	Prettyboy Schist
			Pleasant Grove Schist
			Sykesville Formation
			Piney Run Formation
			Loch Raven Schist
			Cockeysville Marble
			Setters Formation
unconformity			
PRECAMBRIAN			Baltimore Gneiss

Generalized geologic column for Hampstead quadrangle (from Crowley, 1976a).

Mantling these rocks is a variable thickness of overburden consisting of weathered rock (saprolite) and, along the flood plains, alluvium. The nature and thickness of the saprolite depends in part on the rock from which it was derived and its topographic position. In some places, rock that is only slightly weathered is exposed, whereas in other areas the saprolite exceeds 100 ft. It is generally thinner beneath steeper slopes because of erosion. Because well drillers generally set casing 1 or 2 ft into fresh rock, depth of casing of a well is generally a good indication of overburden thickness at that site (Nutter and Otton, 1969, p. 15).

Various soils, classified and mapped by the U.S. Department of Agriculture, Soil Conservation Service, have developed on the assorted surficial materials. The characteristics of a soil depend upon several factors, often summarized by the Jenny Equation (Jenny, 1941, p. 16):

$$s = f\,(cl, o, r, p, t, \ldots)$$

which means that a particular soil characteristic is a function of the environmental factors of climate, organisms, relief, parent material, time, and others. For this reason, it is possible to predict certain subsurface properties by examination of soil maps.

HYDROLOGY

In the crystalline metamorphic rocks of the Piedmont province, ground water occurs chiefly in fractures. Water infiltrating from the overlying unconsolidated material enters and moves along these fractures. Where fractures intersect, greater quantities of water are available. Fractures tend to become fewer in number and tighter with increased depth (LeGrand, 1954), thereby decreasing the amount of water available and the rate at which it can flow. The additional amount of water which can be obtained by drilling deeper is therefore limited. Davis and Turk (1964) present a method for determining the optimum depths of wells in crystalline rocks, considering both hydrologic and economic factors.

Large quantities of water are stored in the pore spaces of the unconsolidated material that overlies the fractured rock. This overburden may consist of saprolite (weathered rock material) or material deposited by streams or mass wasting. Although wells generally tap fractures in the crystalline rock, most water discharged from the wells comes from storage in this unconsolidated material. The rate at which this stored water enters the underlying rock depends on that rock's ability to transmit water; this controls the maximum pumping rate of a well. Some older wells are completed in the unconsolidated material, but they face a greater chance of being contaminated than wells finished in fresh rock that are properly cased and grouted.

The overburden provides renovation for downward-percolating water. The fractures in the rocks have little renovation capacity, and, if contaminated water enters the system of interconnected fractures, it can travel significant distances without adequate purification.

The primary criterion for choosing successful well locations is topography. Wells in valleys and draws tend to have greater yields, whereas those on hilltops are generally deeper and less productive.

Rock type may have an effect on well yield. The strength and mineralogy of a rock unit affect its water-transmitting ability by influencing the development of fractures and weathering.

An analysis of linear features aids in selecting optimum well sites. In some places, these features, called lineaments, are related to zones of intense fracturing. These features are identified by linear segments of stream channels, linear soil or vegetation tonal patterns, and alinement of some geologic features. They can be seen on topographic maps and aerial photographs, but need to be field-checked for verification. Although fractures can occur anywhere, the probability of drilling a well that will intersect at least one water-bearing fracture is increased by choosing a site that is suspected of being in a zone of greater fracture density.

MAPS INCLUDED IN THIS ATLAS

The information in this atlas is presented as five maps, each on a standard topographic quadrangle base:

1. Slope of the Land Surface, by Photo Science, Inc.

2. Location of Wells, Springs, and Test Holes, by Mark T. Duigon and John T. Hilleary.

3. Depth to Water Table, by Mark T. Duigon.

4. Availability of Ground Water, by Mark T. Duigon.

5. Geohydrologic Constraints on Septic Systems, by Mark T. Duigon.

LIMITATIONS OF MAPS

These maps are designed for broad planning purposes and are not meant to substitute for detailed, onsite investigations where required. The boundaries may not be exact because of the scale of the map, data quality, geographical distribution, and the judgment required for interpolation and extrapolation.

CONVERSION OF MEASUREMENT UNITS

In this atlas, figures for measurements are given in inch-pound units. The following table contains the factors for converting these inch-pound units to metric (System International or SI) units:

Inch-pound unit	Symbol	Multiply by	For metric unit	Symbol
inch	(in.)	25.40	millimeter	(mm)
foot	(ft)	0.3048	meter	(m)
mile	(mi)	1.609	kilometer	(km)
gallon	(gal)	3.785	liter	(L)
gallon per minute	(gal/min)	0.0631	liter per second	(L/s)
gallon per day	(gal/d)	0.0438	cubic meter per second	(m^3/s)
gallon per minute per foot	[(gal/min)/ft]	0.2070	liter per second per meter	[(L/s)/m]

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1/ The name of this agency was changed to Maryland Geological Survey in June 1964.

Department of Natural Resources

MARYLAND GEOLOGICAL SURVEY

Kenneth N. Weaver, Director

QUADRANGLE ATLAS NO. 12
HAMPSTEAD QUADRANGLE: HYDROGEOLOGY

By

Mark T. Duigon

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